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ABSTRACT

Over the next 10 years, new video technology, including satellite transmission systems and narrow-casting technology, may create a "communication revolution" in America. Current applications of computers and telecommunications are already making it possible for educational institutions to include the home or the office as learning centers. New information technologies will raise the issues of how educational institutions should be restructured; how curricula should be changed and implemented; how teachers/faculty should be educated to keep pace with a rapidly changing, complex technological society; and what the roles of students and teaching personnel in the learning process should be. Institutions must prepare for high technology by having financial resources, expert personnel, equipment, instructional and faculty commitment, and short-range and long-range plans which are based on well-defined institutional needs, goals, objectives, and resources. This report includes a list of targeted questions on two topics: partnerships of educational institutions with business, and computer and telecommunications instruction. An extensive bibliography is provided. (LMM)

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TITLE OF PRESENTATION: Impact and Implications of Technological Change on Educational Institutions.

Summary: Educational institutions are embracing technology at a rather fast pace, but technology keeps moving more rapidly than can be presently assimilated. This presentation reaches out to give a brief state-of-the-art overview of the current and future status of telecommunications and computers. Examination will be made of the problems and opportunities that educators/educational institutions must confront, when they deal with these high technology areas. This presentation will, also, focus on the impact and implications for schools and will include such topics as: Coping with Confusing Expectations, Preparing for High Technology, Making Better Use of Experts, and Studying for the Future. Recommendations will be presented, and handouts will be provided. Participation in the form of target-questions for audience/panel interaction is planned.

AMERICAN ASSOCIATION OF COUNSELING AND DEVELOPMENT (AACD)

Houston, Texas

March 19, 1984

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THE STATE OF THE ART

For education, high technology is identified with new information technologies--a term that describes the convergence of two technological revolutions, computers and telecommunications, which are transforming America from an industrial society to an information society. Telecommunications (television, cable television, satellite transmission systems, and video technology) and computers are receiving increasing attention as being potentially significant tools for the instruction of on-campus students, and off-campus adult learners, and for the management of more than 3,000 American colleges and universities. These new information technologies will have immense impact on our schools, and they will raise the following issues: 1) how our institutions should be re-structured; 2) how our curricula should be changed and implemented; 3) how our teachers/faculty should be educated to keep pace with a rapidly changing, complex technological society; and 4) what should be the roles of students and teaching personnel in the learning process.

Current applications of computers and telecommunications are making it possible for educational institutions to widen their structures to include the home or the office as the centers of learning. Thus, the learning process does not need to occur within the closed environment of an institution's classroom. During the early 1950s, educators attempted to change the structure of the college/university and the process of learning by introducing instructional television. Then, 114 colleges and universities worked with television stations to present televised college lectures.[1] A short time later, instructional television fell into decline, but it left a few survivors, such as: CBS-TV's "Sunrise Semester" and the City Colleges of Chicago's TV College. The advent of the videotape has generated a renewed interest in instructional television, because the videotape provided more scheduling flexibility for students, television producers, and the colleges and universities. "In 1978-1979, more than 1,800 colleges

and universities used television for instruction, and 735 institutions offered complete courses over television. Some 6,884 courses were offered, enrolling nearly half a million students."[2] It is speculated that instructional television can reach an audience of "64 million people--the total high school graduate population over 25 years of age that has not completed college."[3] Instructional television is especially appropriate for providing educational institutions with the opportunity to reach a selective portion of this population, the highly motivated individuals, who wish to earn their college degrees by being off-campus students. Academe needs to reach this potential population/market.

The dominant mode of instructional television is the telecourse, which combines video/television programs with related printed materials. The keys to the popularity of the telecourse concept are convenience, and faculty-student contact, which may include telephone contacts, on-campus meetings, or interactions by mail or by computer. Some universities are offering telecourses by means of the computer solely. This trend is expected to increase in the future.

Over the next ten years, it is believed that video technology will bring about a "communication revolution" in America.[4] By video technology, I mean new satellite transmission systems, and narrow casting technology, which refers to cable television, instructional television fixed service, and videocassettes and videodiscs equipment. Satellite transmission systems are essential to the development of the communications revolution, because they transmit signals across great distances without terrestrial microwave and/or wire relays, which reduce substantially the cost of long-distance transmission, and transmission from a single source to numerous receiving sources spread over a huge geographic area.[5] In 1974, there were only a few cable television systems, which were linked together by terrestrial microwave, but, by 1979, there were more than 2,000 cable systems, which participated in a satellite-interconnected network,[6] and this number is increasing. Currently, there are approximately 4,000 cable systems, which serve 9,000 communities and 40 million people.[7] Furthermore, industry projections indicate that 60 percent of the U.S. homes will have cable

television by 1993.[8] Presently, some institutions are getting involved in interactive instructional programs through the instructional television fixed services (ITFS) system. At the University of Southern California, live courses are transmitted to industrial facilities in the Los Angeles area, and students at these sites respond to their instructor and to their fellow students by pressing an ITFS button or by teleconferencing. Daily class materials and homework are sent to students by courier service. In the future, the computer is expected to perform this service. Finally, personal video systems, which were made possible by the advent of videodiscs and videocassettes, offer individualized instruction to students. Institutions would be wise to target more of their programs for the home video viewers, since it is estimated that, by 1985, 10 percent of America's television households will own videodisc or videocassette equipment.[9]

Computers or microcomputers are extensively used at our educational institutions, which are able to afford them. At all levels, it is estimated that some 300,000 personal computers are used at our schools,[10] and, of this number, approximately 150,000 personal computers are in use today at our college campuses.[11] "Colleges and universities now spend about $300-million a year for use of computers in instruction, ... [and] that meeting the needs for student access would cost $1-billion or more a year,"[12] since it is estimated that students require four times as much access to computers, as they are getting now.[13] The onrush of the computer has brought about a variety of new institutional problems: rising educational costs relevant to computers and telecommunications; needing more computer space; queing for the use of computers; struggling with inappropriate copyright laws; needing more qualified teaching personnel; determining and establishing criteria for computer literacy; and changing/updating the computer science and engineering curricula.

COPING WITH CONFUSING EXPECTATIONS

The booming interest in computers has caused confusing expectations in our schools. In March, 1983, The Chronicle of Higher Education reported the following findings:

> ... only a relatively few campuses are successfully adapting to the latest technological developments. For the most part, ... academe is not only failing to keep up with the new technology, and related demands, but it is falling further and further behind.
>
> If the trend persists, ... the ultimate cost--particularly in lost educational opportunities--will be staggering.
>
> But in case after case, colleges are discovering that they don't have the money, personnel, or plans to take adequate advantage of existing technology, let alone the breakthroughs still to come.[14]

At all levels, our schools have been urged to change the curriculum to include computer literacy instruction, since our schools are expected to assume leadership in training our citizens to use computers, and to conduct research in computer and other relevant technologies. Ironically, high-technological companies rather than American educational institutions are the leaders in computer technology. Furthermore, these profit-making companies rather than our educational institutions are shaping the future of computer education. Given these facts, I recommend that educational institutions should consider seriously in entering partnerships with business companies to share their mutual resources to prepare our citizens for the high-tech needs of today and tomorrow.

PREPARING FOR HIGH TECHNOLOGY

American educational institutions must continue to prepare for high technology. This involves having financial resources, personnel with expertise, equipment, institutional and faculty commitment, and short-range and long-range plans, which are based on well-defined institutional needs, goals, objectives, and resources. To enable our institutions to offer the high-technological training required for the future, President Reagan recently proposed a $76-million federal plan to reduce the shortage of science and mathematics teachers.[15] Congress approved about $120-million dollars for the 1984 fiscal year, and with additional support from other agency programs for engineering research pertinent to computers and manufacturing processes.[16] Moreover, the N.S.F. estimated that it will spend as much as $170-million on engineering research in 1984.[17] Our schools, at all levels, are receiving additional aid from private foundations and companies in the form of monies, research, grants, scholarships, fellowships, equipment, and free computer instruction for teachers. Colleges/universities received $8.59-billion

from 52 foundations in 1982 for educational research.[18] As for industry, the Radio Shack Corporation, for example, provided free computer instruction to more than 125,000 teachers in 1983;[19] several high-tech companies have given schools 30-65 percent discounts on computer hardware and software;[20] IBM, for example, gave 20 universities $40-million in computers in 1983, as an incentive to increase the productivity of graduate engineering students,[21] and an additional $10-million will be given to 5 colleges and universities to encourage them to plan new engineering curricula designed to keep pace with the new computer and manufacturing technologies.[22] Some educational institutions are helping themselves. To offset the costs of computers, and to provide immediate computer instruction for students, institutions, like Drew University and Carnegie-Mellon University, are requiring their students to purchase their own computers, or they are billing students for their own computer units as part of their tuition fees.[23] These efforts may still not be enough. More educational institutions will need to consider ways to keep their curricula up-to-date in instructing students in computer and engineering technologies. In addition, all levels of government should be committed to aid education in providing monies, facilities, and personnel to train our teachers to acquire expertise in the computer, telecommunications, and advanced manufacturing technologies.

MAKING BETTER USE OF EXPERTS

Over the past decade, the number of undergraduates majoring in engineering and computer science has increased 80 percent, but, during this period, the number of faculty with doctorates in these areas increased only 10 percent.[24] It is clear that our current number of graduate students are not able to fill nearly 2,000 needed faculty positions.[25] There is a need for more experts, and a need to make better use of available technically trained personnel. To meet the demand for computer faculty, postsecondary institutions are engaged in the following practices: 1) using master-level students to teach lower-level engineering and computer courses; 2) providing stipends and other rewards to personnel, who strive to gain expertise in computer science in order to instruct students and other professionals; 3) entering into partnerships with industry to train their

faculty and students in the computer and manufacturing technologies, to provide input in designing curricula, to conduct research, and to create computer software for education; and 4) forming telecommunication and computer networks/consortia with other educational institutions to share or to exchange personnel, equipment, and information on technological matters. In view of the plight of our educational institutions in regard to their need for trained personnel in the high-technological fields, it is clear that education must focus more attention on technical education to meet the future manpower needs of America in regard to the new, high-tech occupations.

STUDYING FOR THE FUTURE

"Within four years, 16 million home computers with learning programs will compete seriously for the learner's time, with an expected home-education market of $3-billion annually."[26] This suggests that business is a prime competitor of the educational sector in providing educational services for America in the future. To safeguard excellence in education, the educational community should study ways and means of cooperating with businesses in the production of educational programs for computer and video usage; educational institutions must make a strong effort to capture the potentially large home-education market; and educators must be trained to create educational programs or courses for home computers and telecommunication systems. Finally, American education must focus more attention on technical education, which emphasizes training for the new occupations created by high technology, such as: 1) laser technicians; 2) computer programmers, operators, and analysts; and 3) maintenance and service workers for computers, telecommunication systems, and advanced manufacturing machinery. To meet the rapidly increasing demand for high-technological training, or to re-train the masses, educational institutions must prepare for the future by reaching out to a broader spectrum of the populace. There is a need to take full advantage of telecommunication systems to attract home audiences, the off-campus adult learners. Educational institutions must become more involved in creating educational software for home computers, and they must be prepared to instruct life-long learners.

In conclusion, educational institutions are embracing technology at a rather fast pace, but technology keeps moving more rapidly than can be presently assimilated. These recommendations are designed to help educational institutions to keep abreast of change in order to meet the technological challenges of the future.

TARGETED QUESTIONS

Partnerships of Educational Institutions with Businesses

1) What agreements should be made between businesses and institutions in regard to the creation of computer hardware and software by students, faculty, and company personnel?
2) What ethical issues are involved for faculty, who wish to conduct research for companies, or who wish to do consulting with companies.

Computer and Telecommunications Instruction

3) How can American education best train their teaching personnel to cope adequately with the computer and telecommunications technologies?
4) What can be done to promote faculty and institutional support and committment to instructional television and computer instruction?
5) Will the computer solve our nation's educational crisis in regard to excellence?

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[3]Carol H. Shulman, "Instructional Television--Higher Education Without Commercial Interruption," Research Currents, (May, 1981), p. 7.

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[11]George W. Bonham, "Computer Mania: Academe's Inadequate Response to the Implications of the New Technology," The Chronicle of Higher Education, Volume XXVI, No. 5 (March 30, 1983), p. 72.

[12]Jack Magarrel, "College Students Said to Require $1-Billion a Year for Computing," The Chronicle of Higher Education, Volume XXVI, No. 1 (March 2, 1983), p. 1.

[13]Op. cit.

[14]Robert Jacobson, "Colleges Struggling to Cope with the Computer," The Chronicle of Higher Education, Volume XXVI, No. 5 (March 30, 1983), p. 1.

[15]Jack W. Fuller, "Getting Started in High Technology," Educational Horizons (Fall, 1983), p. 25.

[16]Kim McDonald, "Engineering Research to Get More Emphasis in National Science Foundation's Programs," The Chronicle of Higher Education, (September 7, 1983), p. 20.

[17]Op. cit.

[18]"Fact-File: Giving in 1982: Colleges Got $8.59-Billion," The Chronicle of Higher Education (June 29, 1983), p. 8.

[19]Arielle Emmett, "American Education: The Dead End of the 80s," The Chronicle of Higher Education (August, 1983), p. 101.

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[21]Judith A. Turner, "IBM Gives 20 Universities $40-Million in Computers," The Chronicle of Higher Education (June 29, 1983), p. 3.

[22]Op. cit.

[23]Judith A. Turner, "Drew University to Issue Computers to All Freshmen," The Chronicle of Higher Education (November 2, 1983), p. 3; C. Farrell, "The Computerization of Carnegie-Mellon," The Chronicle of Higher Education, Volume XXVI, No. 5 (March 30, 1983), pp. 6-7.

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[25]Op. cit.; Louis Robinson, "The Computer: An Enabling Instrument," Current Issues in Higher Education, No. 1 (1983-1984), p. 12.

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